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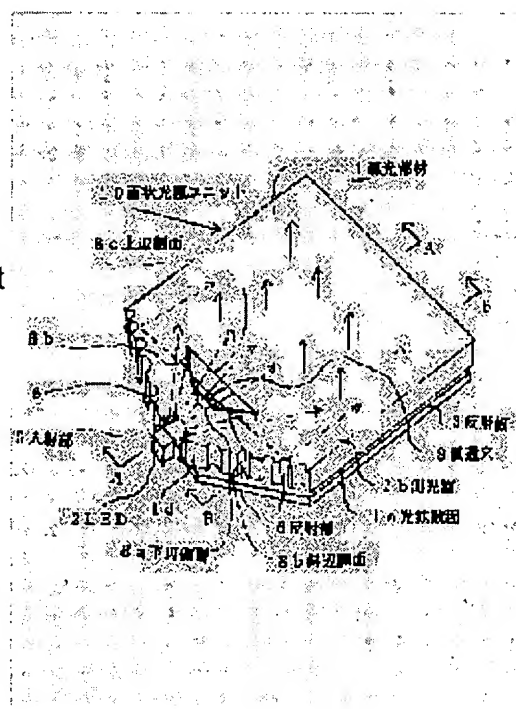
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(54) SURFACE LIGHT SOURCE UNIT

(57)Abstract:

PROBLEM TO BE SOLVED: To suppress irregularities in brightness of illumination light in an edge-light type surface light source unit, using a point light source such as an LED, as its light source.

SOLUTION: This edge-light type surface light source unit 10 has a light guide member 1 and a light source 2, disposed close to a side face of the light guide member 1. The light guide member 1, made of a light-transmitting material and shaped like a plate, has a first principal plane serving as a light-emitting surface 1b and a light-diffusing means provided on a second principal plane 1a confronting the first principal plane. The light guide member 1 is provided with a through-hole 8 or blind hole and reflection parts 6 on its side faces 1d. The through-hole 8 or blind hole has functions of portioning out the light incoming from the light source 2 to right and left and of letting a part of it pass therethrough. Thus, the light from the light source 2 is uniformly diffused by optical-path changing into a state having no directivity and then radiated to upper and lower surfaces of the light guide member, and a surface-like light flux with uniform brightness can be emitted from the light-emitting surface 1b.



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CLAIMS

[Claim(s)]

[Claim 1] Light guide section material which consisted of a translucent material, used the tabular configuration nothing, used the 1st principal plane as the light exiting surface, and formed the optical diffusion means in this 1st principal plane and the 2nd principal plane which counters The light source which approached the side face of this light guide section material, and was allotted the both sides of the part which is the source unit of sheet-like light equipped with the above, prepares one or more through holes which have the function to refract and reflect the outgoing radiation light of said light source in said light guide section material, and counters with said light source in the side face of said light guide section material -- the thickness direction of light guide section material -- abbreviation -- it is characterized by preparing the reflective section which consists of two or more parallel slots of an approximate circle arc.

[Claim 2] Light guide section material which consisted of a translucent material, used the tabular configuration nothing, used the 1st principal plane as the light exiting surface, and formed the optical diffusion means in this 1st principal plane and the 2nd principal plane which counters The light source which approached the side face of this light guide section material, and was allotted the both sides of the part which is the source unit of sheet-like light equipped with the above, prepares the blind hole which became depressed in the one or more thickness directions which have the function refract and reflect the outgoing-radiation light of said light source in said light guide section material, and counters with said light source in the side face of said light guide section material -- the thickness direction of light guide section material -- abbreviation -- it is characterized by to prepare the reflective section which consists of two or more parallel slots of an approximate circle arc.

[Claim 3] The slot of an approximate circle arc of said reflective section is a source unit of sheet-like light according to claim 1 or 2 characterized by being arranged so densely that it becoming far from said light source.

[Claim 4] The angle which the side faces of said light source of said light guide section material and the both sides of the part which counters make is a source unit of sheet-like light according to claim 1 to 3 which is smallness and is characterized by forming the ejection part of an abbreviation triangle in a part of light guide section material of these side faces rather than 180 degrees.

[Claim 5] The flat-surface configuration of the through hole prepared in said light guide section material or a blind hole is a source unit of sheet-like light according to claim 1 to 4 which has the shape of an abbreviation inverse triangle which sees from said light source and serves as bilateral symmetry, and is characterized by allotting said light source to the top-most vertices which the 2 equilateral of the triangle makes, and the location which counters.

[Claim 6] Two sides which face said light source of the through hole of said said abbreviation inverse triangle configuration or a blind hole are a source unit of sheet-like light according to claim 5 characterized by being formed by a part of paraboloid.

[Claim 7] The flat-surface configuration of the through hole prepared in said light guide section material or a blind hole is a source unit of sheet-like light according to claim 1 to 4 which is the **** type

configuration which sees from said light source and serves as bilateral symmetry, and is characterized by allotting said light source to the short lower side of the reverse base type, and the location which counters.

[Claim 8] The configuration of the boundary of the side which counters said said light source of the flat-surface configuration of the through hole prepared in said light guide section material or a blind hole is a source unit of sheet-like light according to claim 1 to 4 characterized by consisting of the side of a polygon similar to a convex curve or this convex toward the light source.

[Claim 9] They are claim 1 which the blind hole prepared in said light guide section material has opening in said 1st principal plane, and does not have opening in said 2nd principal plane, but is characterized by the base being abbreviation parallel at the 2nd principal plane, and a source unit of sheet-like light according to claim 3 to 8.

[Claim 10] The blind hole prepared in said light guide section material is claim 1 which has opening in said 1st principal plane, and does not have opening in said 2nd principal plane, but is characterized by cross sections perpendicular to said direction of the light source of the blind hole being five square shapes which have two convex sides, and a source unit of sheet-like light according to claim 3 to 8.

[Claim 11] The blind hole prepared in said light guide section material is claim 1 characterized by having opening in said 1st principal plane, and not having opening in said 2nd principal plane, but forming optical diffusion means, such as two or more irregularity, in the base, and a source unit of sheet-like light according to claim 3 to 8.

[Claim 12] The optical diffusion means formed in the 2nd principal plane of said light guide section material is a source unit of sheet-like light according to claim 1 to 11 characterized by being the impression of a crimp or two or more hemispherical dots.

[Claim 13] Said light source is a source unit of sheet-like light according to claim 1 to 12 characterized by being LED.

[Claim 14] Said LED is a source unit of sheet-like light according to claim 13 characterized by being white LED.

[Claim 15] Said LED is a source unit of sheet-like light according to claim 13 characterized by being LED of three colors of R, G, and B which have been perpendicularly arranged in the thickness direction of said light guide section material.

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DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Field of the Invention] This invention relates to the source unit of sheet-like light of a display which has the back light device which irradiates a transparency mold or a transfective type panel from a tooth back.

[0002]

[Description of the Prior Art] In recent years, moreover, the liquid crystal display which has a legible back light device is used with the thin shape as an indicating equipment of the word processor and computer of a book mold or a cellular-phone machine, small [like cellular phone TV], and thin information machines and equipment. such a back light device -- carrying out -- the source of sheet-like light which irradiates a liquid crystal panel over the whole surface from behind being used, and, although what consists of a fluorescent lamp which is a linear source of luminescence as this source of sheet-like light, and a light guide plate which changes that flux of light into the flux of light of the shape of a field which irradiates a liquid crystal panel was common In recent years, what arranged two or more LED (light emitting diode) as a linear source of luminescence for the purpose of the further thin shape and reinforcement at the single tier instead of the fluorescent lamp has come to be used.

[0003] Drawing 9 and drawing 10 are drawings showing the source unit of sheet-like light for the panels of an edge light method with the LED (light emitting diode) array light source as an example of such a conventional back light device, drawing 9 is a perspective view and drawing 10 is the sectional view. In drawing 9 and drawing 10, 110 is a source unit of sheet-like light, and has two or more LED102 arranged to the line as the light guide section material 101 and the light source. The light guide section material 101 is carrying out the abbreviation rectangular parallelepiped configuration with tabular [which consists of translucent part material, such as transparent plastics material,], sets the large field of one of these to optical outgoing radiation side 101b, and in this optical outgoing radiation side 101b and the field which counters As a means for reflecting the light from the light source towards said optical outgoing radiation side which counters, optical diffusing-surface 101a, such as two or more minute crimps or two or more hemispherical dots, is formed in the front face.

[0004] Furthermore, said optical diffusing-surface 101a is approached, and the reflecting plates 103, such as a white sheet, are arranged. The light emitted from LED102 goes into a transparent material 101, and a great portion of light carries out outgoing radiation of the dispersion according [accord / at top-face (optical outgoing radiation side) 101b / total reflection / light] in an inferior surface of tongue to optical diffusing-surface 101a, such as total reflection, a crimp, or a hemispherical dot, from a top face to the exterior, 1 time or after carrying out two or more times. Under the present circumstances, although a part of light penetrates an inferior surface of tongue and it carries out incidence to a reflecting plate 103, it is reflected here and goes into the light guide section material 101 again, and after passing through reflection directly, outgoing radiation will be carried out outside from a top face. The light which carried out outgoing radiation outside is penetrated liquid crystal panel 7, and is illuminated. In order to secure the homogeneity of the brightness within said field to illuminate, the granularity of the

crimp in the above-mentioned inferior surface of tongue was adjusted, and the configuration of a hemispherical dot and the consistency were changed by the location.

[0005]

[Problem(s) to be Solved by the Invention] However, there are the following troubles in the source unit of sheet-like light mentioned above. Namely, although a certain amount of homogeneity of the brightness within the field of lighting can be adjusted by adjusting the granularity of a crimp or changing the configuration of a hemispherical dot, and a consistency by the location There is a limit also in this, and in order to realize it, the light emitted from one side of the side face of light guide section material carries out two or more arrays of the point light sources, such as LED, and it must be made be a linear light source with a certain amount of homogeneity, and to approximate it to a linear light source. That is, since the strength of luminescence changes that the number of LED is one with the directions sharply for the directivity, the effect surely appears as uneven distribution of the brightness of the illumination light, and the homogeneous lighting of it becomes impossible. Therefore, much LED was needed and there was a problem of causing a cost rise and increase of the consumed electric current.

[0006] This invention makes it a technical problem to improve the aforementioned trouble in the conventional technique. And this invention solves this technical problem and aims at enabling it to carry out outgoing radiation of the flux of light of the shape of a uniform field using LED of 1 near the point light source as the light source, or the small number in the source unit of sheet-like light of an edge light method. Thereby, the illumination light is uniform and it becomes possible to offer the cheap source unit of sheet-like light by which the cost of the light source and reduction of power consumption were made.

[0007]

[Means for Solving the Problem] As the 1st means in order to solve the above-mentioned technical problem this invention The light guide section material which consisted of a translucent material, used the tabular configuration nothing, used the 1st principal plane as the light exiting surface, and formed the optical diffusion means in this 1st principal plane and the 2nd principal plane which counters, In the source unit of sheet-like light of an edge light method which has the light source which approached the side face of this light guide section material, and was allotted the both sides of the part which prepares one or more through holes which have the function to refract and reflect the outgoing radiation light of said light source in said light guide section material, and counters with said light source in the side face of said light guide section material -- the thickness direction of light guide section material -- abbreviation -- it is characterized by preparing the reflective section which consists of two or more parallel slots of an approximate circle arc.

[0008] As the 2nd means in order to solve the above-mentioned technical problem this invention The light guide section material which consisted of a translucent material, used the tabular configuration nothing, used the 1st principal plane as the light exiting surface, and formed the optical diffusion means in this 1st principal plane and the 2nd principal plane which counters, In the source unit of sheet-like light of an edge light method which has the light source which approached the side face of this light guide section material, and was allotted The blind hole which became depressed in the one or more thickness directions which have the function to refract and reflect the outgoing radiation light of said light source in said light guide section material is prepared. the both sides of the part which counters with said light source in the side face of said light guide section material -- the thickness direction of light guide section material -- abbreviation -- the source unit of sheet-like light characterized by preparing the reflective section which consists of two or more parallel slots of an approximate circle arc.

[0009] In order to solve the above-mentioned technical problem, it is characterized by arranging this invention in said the 1st means or 2nd means so densely that the slot of an approximate circle arc of said reflective section becoming far from said light source as the 3rd means.

[0010] In order to solve the above-mentioned technical problem, as the 4th means, rather than 180 degrees, the angle which the side faces of the both sides of the part which this invention counters with said light source of said light guide section material in either said 1st means thru/or the 3rd means make is smallness, and is characterized by forming the ejection part of an abbreviation triangle in a part of

light guide section material of these side faces.

[0011] In order to solve the above-mentioned technical problem, it is characterized by allotting said light source to the top-most vertices which the flat-surface configuration of the through hole or blind hole by which this invention was prepared in said light guide section material in either said 1st means thru/or the 4th means has the shape of an abbreviation inverse triangle which sees from said light source and serves as bilateral symmetry, and the 2 equilateral of the triangle makes, and the location which counters as the 5th means.

[0012] In order to solve the above-mentioned technical problem, it is characterized by two sides by which this invention faces said light source of the through hole of said said abbreviation inverse triangle configuration or a blind hole in said 5th means being formed by a part of paraboloid as the 6th means.

[0013] In order to solve the above-mentioned technical problem, as the 7th means, the flat-surface configuration of the through hole or blind hole by which this invention was prepared in said light guide section material in either said 1st means thru/or the 4th means is a **** type configuration which sees from said light source and serves as bilateral symmetry, and it is characterized by allotting said light source to the short lower side of the reverse base type, and the location which counters.

[0014] In order to solve the above-mentioned technical problem, it is characterized by the configuration of a near boundary where this invention counters said said light source of the flat-surface configuration of the through hole prepared in said light guide section material in either said 1st means thru/or the 4th means or a blind hole consisting of the side of a polygon similar to a convex circular curve or this convex toward the light source as the 8th means.

[0015] In order to solve the above-mentioned technical problem, as the 9th means, the blind hole which prepared this invention in said light guide section material in either said 1st means and the 3rd means thru/or the 8th means has opening in said 1st principal plane, and it does not have opening in said 2nd principal plane, but the base is characterized by being abbreviation parallel at the 2nd principal plane.

[0016] In order to solve the above-mentioned technical problem, as the 10th means, the blind hole which prepared this invention in said light guide section material in either said 1st means and the 3rd means thru/or the 8th means has opening in said 1st principal plane, and it does not have opening in said 2nd principal plane, but a cross section perpendicular to said direction of the light source of the blind hole is characterized by being five square shapes which have two convex sides.

[0017] In order to solve the above-mentioned technical problem, as the 11th means, the blind hole which prepared this invention in said light guide section material in either said 1st means and the 3rd means thru/or the 8th means has opening in said 1st principal plane, and it does not have opening in said 2nd principal plane, but is characterized by forming optical diffusion means, such as two or more irregularity, in the base.

[0018] In order to solve the above-mentioned technical problem, it is characterized by an optical diffusion means by which this invention was prepared in the 2nd principal plane of said light guide section material in either said 1st means thru/or the 11th means being the impression of a crimp or two or more hemispherical dots as the 12th means.

[0019] In order to solve the above-mentioned technical problem, this invention is characterized by said light source being LED in either said 1st means thru/or the 12th means as the 13th means.

[0020] In order to solve the above-mentioned technical problem, this invention is characterized by said LED being white LED in said 13th ***** as the 14th means.

[0021] In order to solve the above-mentioned technical problem, this invention is characterized by said LED being LED of three colors of R, G, and B which have been perpendicularly arranged in the thickness direction of said light guide section material in said 13th ***** as the 15th means.

[0022]

[Embodiment of the Invention] Below, the gestalt of 1 operation of this invention is explained based on a drawing. The gestalt of this operation is related with the source unit of sheet-like light equipped with LED which counters the light guide section material which has the through hole which has the operation which distributes incident light to right and left, and its through hole. Drawing 1 is the perspective view showing the configuration of the source unit of sheet-like light concerning the gestalt of this operation,

drawing 2 is the sectional view, (a) is the A-A sectional view of drawing 1, and (b) is a B-B sectional view. In drawing 1, 10 is a source unit of sheet-like light, and is constituted by LED2 and the reflecting plate 3 which are the light guide section material 1 and the light source. The light guide section material 1 consists of translucent materials, such as optical plastic material, and it is prepared so that opening may be carried out to the top face which is light exiting surface 1b which the blind hole 4 of the flat-surface configuration of an abbreviation inverse triangle which has optical refraction and the function which carries out a light reflex mentions later. Said blind hole 4 is arranged in right above [of LED2 / abbreviation]. And two sides (field) by which the configuration of a blind hole 4 faces LED2 are carrying out the configuration of abbreviation paraboloid 4a. By total reflection, the light which came out of the focus of paraboloid 4a turns into a light parallel to the axis of a paraboloid in paraboloid 4a. Therefore, it can distribute to right and left by arranging LED2 to the focus of paraboloid 4a by making into a parallel ray most light which reflected paraboloid 4a.

[0023] The reflective section 6 which consists of two or more radii slots parallel to the thickness direction is formed in 1d of side faces of the part which the configuration of the incidence section 5 of said light guide section material 1 is the roll off of a hemicycle, and the both sides projected. The slot of this reflective section 6 is arranged so densely that it keeps away from LED of the light source. In addition, although the reflective section shown in this example consists of a radii slot, it is good also as the reflective section by partially or on the whole forming in a side face the split face from which scattered reflection is instead started.

[0024] One large field of said light guide section material 1 is set to light exiting surface 1b, and becoming optical diffusing-surface 1a which consists of an impression of two or more minute crimps or two or more hemispherical dots etc. is formed in the front face as a radiation means for making the light exiting surface 1b and the field which counters turn and carry out scattered reflection of the light from LED2 to said light exiting surface 1b. It is the same as that of the conventional technique to approach said optical diffusing-surface 1a, and to arrange the reflecting plates 3, such as a white sheet. The same effectiveness is acquired even if it makes the silver vacuum evaporatio film etc. adhere to optical diffusing-surface 1a instead of this reflecting plate 3. Moreover, although illustration is omitted, if needed, 1d of side faces in which the reflective section 6 which consists of said radii slot of the light guide section material 1 is formed, and other side faces can be countered or contacted, and the reflective member by the reflective sheet, silver vacuum evaporatio, etc. can also be prepared in them. In addition to blind-hole 4 of the above-mentioned inverse triangle, two or more through holes or blind holes which are not illustrated in the location of a request of the right and left can be formed, and the direction of a light emission can be adjusted freely. In addition, LED used for the gestalt of this operation may be LED of any 1 color of R, G, and B, and may be white LED.

[0025] it is shown in drawing 2 (a) -- as -- base 4c of a blind hole 4 -- inferior-surface-of-tongue 1a of the light guide section material 1 -- parallel -- the bottom -- being alike -- bypass section 1c of the light guide section material 1 exists. The above configuration explains per operation of the source unit of sheet-like light. As shown in drawing 1, the light injected from said LED2 goes into the light guide section material 1, the part is reflected by paraboloid 4a of said blind hole 4 as the 1st root **, and other parts go into said bypass section 1c of the blind-hole 4 bottom as the 2nd root **, as shown in drawing 2 (a). Furthermore, as shown in drawing 1, as the 3rd root **, the remaining things pass along parts other than paraboloid 4a and bypass section 1c of the blind-hole 4 bottom, namely, pass through right and left of a blind hole 4, and go into a part for the main light-emitting part of the light guide section material 1.

[0026] In the reflective section 6 which consists of a radii slot as the light reflected by paraboloid 4a as the 1st root ** is shown in drawing 1 As it can extend right and left by optical-path conversion and the light which was able to be extended shows drawing 2 (b) so that it may be refracted and reflected and the point light source may turn into the line light source Incidence is carried out to optical diffusing-surface 1a which is light exiting surface 1b or the inferior surface of tongue which is a top face of the light guide section material 1, it is scattered about with said lower reflecting plate 3, and outgoing radiation of scatter reflection or the transmitted light according to total reflection in a top face is carried out as illumination light from light exiting surface 1b. [according to the impression of total reflection or

a crimp, and a hemispherical dot etc. in an inferior surface of tongue] Under the present circumstances, the brightness of the light which carries out incidence to the reflective section 6 is in the inclination to fall, so that it keeps away from LED due to a solid angle. However, as mentioned above, since the consistency of two or more slots of the reflective section 6 is so dense that it keeps away from LED, the brightness of light reflected in the reflective section 6 light-guide-section material 1 falls also [near the edge of the right and left].

[0027] In addition, as described above, the side face in which the reflective section 6 is formed is countered or contacted, the reflective section 6 or the transmitted light from these side faces is scattered on a ***** case with a reflective sheet etc., reflective members, such as a reflective sheet, are again returned in the light guide section material 1, the effectiveness of optical-path conversion is raised, and it has the effectiveness of finally raising the brightness of the illumination light.

[0028] As the 2nd root **, total reflection of the light included in bypass section 1c is carried out by base 4c of a blind hole 4. The scatter reflection according to the impression of total reflection or a crimp, and a hemispherical dot etc. at optical diffusing-surface 1a which is the inferior surface of tongue of this and the light guide section material 1 which counters Or the transmitted light is scattered about with said lower reflecting plate, and after passing said bypass section 1c, repeating these reflection and dispersion, outgoing radiation is carried out as illumination light from light exiting surface 1b by the principle same with having described above. Next, incidence of the light which went into a part for the main light-emitting part of a transparent material 1 through right and left of a blind hole 4 as the 3rd root ** is carried out to optical diffusing-surface 1a which is light exiting surface 1b or the inferior surface of tongue which is a top face of the light guide section material 1, and they is scattered about with said lower reflecting plate, and carries out outgoing radiation of scatter reflection or the transmitted light according to total reflection in a top face as illumination light from light exiting surface 1b. [according to the impression of total reflection or a crimp, and a hemispherical dot etc. in an inferior surface of tongue].

[0029] Thus, although the light which passed along three kinds of roots from light exiting surface 1b will carry out outgoing radiation, since it can distribute to right and left, some which are depended on 1st root ** reflected by the aforementioned paraboloid 4a have the inclination for the brightness of light to serve as size from a center in a part on either side among light exiting surface 1b. Since what is depended on 3rd root ** passes along right and left of a blind hole 4, there is an inclination for the brightness of light to serve as size from a center in a part on either side among light exiting surface 1b, similarly. On the other hand, what is depended on 2nd root ** which passes bypass section 1c has the inclination for the brightness of light to serve as size from a part on either side in a central part among light exiting surface 1b in order to mainly pass through a center.

[0030] Then, the brightness of the outgoing radiation light for the lighting in the whole light exiting surface 1b can be made into the thing of homogeneity or abbreviation homogeneity by complementing the property of the brightness mutually by selecting appropriately the rate of the amount of the light by said the 1** and 3rd root **, and the amount of the light by 2nd root **. The balance of such brightness can be attained by choosing appropriately the ratio of the width of face of the longitudinal direction of said blind hole 4, and the depth t1 and the thickness t2 of bypass section 1c. Moreover, changing the granularity of the crimp of inferior-surface-of-tongue 1a for equalization of the brightness of the illumination light, or changing the configuration of the impression of a hemispherical dot and a consistency by the location makes the same operation as the conventional technique in this case. Thus, the illumination light which carried out outgoing radiation from light exiting surface 1b of the light guide section material 1 penetrates a liquid crystal panel 7, and lighting without brightness nonuniformity is made.

[0031] Below, based on a drawing, the gestalt of other one operation of this invention is explained. The gestalt of this operation is related with the source unit of sheet-like light equipped with LED which counters the light guide section material equipped with the through hole which has the operation which distributes incident light to right and left, and its through hole. Drawing 3 is the perspective view showing the configuration of the source unit of sheet-like light concerning the gestalt of this operation,

drawing 4 is the sectional view, (a) is the A-A sectional view of drawing 3, and (b) is a B-B sectional view. About the source unit 10 of sheet-like light which starts the gestalt of this operation as shown in drawing 3 and drawing 4, the through hole 8 which has the flat-surface configuration of a reverse trapezoid which has optical refraction and the function which carries out a light reflex is formed in the light guide section material 1. And LED2 is arranged in the location which counters short lower side side-face 8a of the reverse trapezoid. Oblique side side-face 8b of the both sides of short lower side side-face 8a of said reverse trapezoid through hole 8 can also consist of paraboloids. 8c is a surface side face which counters said lower side side-face 8a in a through hole 8. About other configurations shown in drawing 3 and drawing 4, and the notation of a component, it is the same as that of drawing 1 and the source unit 10 of sheet-like light shown in 2.

[0032] The above configuration explains per operation of the source unit of sheet-like light concerning the gestalt of this operation. As shown in drawing 3, the light injected from said LED2 goes into the light guide section material 1, and in the center section, the light which carried out incidence to said lower side side-face 8a of a through hole 8 As shown in drawing 4 (a), after passing through the side face concerned by refraction, it passes through the inside of a through hole 8, surface side-face 8c of the opposite side is passed by refraction, and it enters in the light guide section material 1 again, and, finally injects from light exiting surface 1b by the principle same with having already explained after that. Here, the dimension of lower side side-face 8a is set up so that the incident angle of the light to lower side side-face 8a may serve as smallness from critical angle (as opposed to air) θ_{c1} of the light guide section material 1 also in the greatest case.

[0033] As total reflection is carried out in the side face concerned, it can distribute to right and left and it is shown in drawing 4 (b), after being reflected by the reflective section 6, the light which carried out incidence to oblique side side-face 8b of a through hole 8 goes into the range of light exiting surface 1b, and, finally is injected from light exiting surface 1b by the principle same with having already explained. Here, the dimension of oblique side side-face 8a and the configuration (especially include angle) are set up so that the incident angle of the light to oblique side side-face 8b may serve as size from critical angle (as opposed to air) θ_{c1} of the light guide section material 1 also in the minimum case.

[0034] The light which separated from the through hole 8 among the light which carried out incidence to the light guide section material 1 and which carried out incidence to the both sides reaches the vertical side of the principal part of the light guide section material 1 directly, and, finally is injected from light exiting surface 1b by the principle same with having already explained. Thus, although the light which carried out incidence to the light guide section material 1 from LED2 is injected from a light exiting surface through three kinds of above-mentioned roots and turns into illumination light, the brightness of the outgoing radiation light for the lighting in the whole light exiting surface 1b can be made into the thing of homogeneity or abbreviation homogeneity by the principle same with having already explained by setting up appropriately the rate of the amount of the light which passes through each root. This purpose can be attained by specifically setting up appropriately the lower side, the surface, and the height dimension of a reverse trapezoid which are the distance from LED2 of a through hole 8, and the flat-surface configuration of a through hole. Thus, the illumination light which carried out outgoing radiation from light exiting surface 1b of the light guide section material 1 penetrates a liquid crystal panel 7, and lighting without brightness nonuniformity is made.

[0035] the following -- a drawing -- being based -- the gestalt of other one operations of this invention -- ** -- it carries out and the example of transformation of the source unit of sheet-like light shown in drawing 3 is explained. Drawing 5 is drawing showing the configuration of the source unit of sheet-like light concerning this example of transformation, (a) is a perspective view and (b) is the A-A sectional view of (a). Although the light guide section material 1 has the through hole 8 in the source unit 10 of sheet-like light concerning the gestalt of this operation as shown in drawing 5, the flat-surface configuration of the through hole 8 is both bowstring configuration, the boundary of the side which counters LED is 8d of bottom sides of the shape of a convex approximate circle cylindrical surface, and this and the boundary of the side which counters are top side 8e of the shape of a convex approximate circle cylindrical surface. Other configurations and notations of a part of the source unit 10 of sheet-like

light which are shown in drawing 5 are the same as that of what was shown in drawing 3.

[0036] As shown in drawing 5 (b), what carried out incidence to the central part d1 of 8d of bottom sides from p2 shown in drawing 5 (a) among the light which went into 8d (side face in which it results in p1, p2, p3, and p4 of drawing 5) of bottom sides of light guide section material, from LED2 to p3 This part is passed by refraction, top side 8e is passed through a through hole 8, and incidence is again carried out to the light guide section material 1. In this part, total reflection of the light which carried out incidence to 2 among 8d of bottom sides 8d of 8d both-sides sections of the both sides of 1 of said center sections is carried out, and it can be distributed to right and left. Although it increases continuously and the incident angle over 8d of bottom sides from LED2 goes here as it is zero and separates from there right and left right above LED2 In 1, an incident angle is smallness from critical angle θ_c of the light guide section material 1 8d of said center sections, and the incident angle serves as size from critical angle θ_c of the light guide section material 1, an EQC, or it in 2 (parts of p1-p2, and p3-p4) 8d of said both-sides sections. The light which separated from the through hole 8 among the light which carried out incidence to the light guide section material 1 and which carried out incidence to the both sides reaches the vertical side of the principal part of the light guide section material 1 directly.

[0037] Although the light which carried out incidence to the light guide section material 1 from LED2 is injected from light exiting surface 1b by the principle same with having already explained and turns into illumination light after it passes through three kinds of above-mentioned roots By setting up appropriately the rate of the amount of the light which passes through each root, the brightness of the outgoing radiation light for the lighting in the whole light exiting surface 1b can be made into the thing of homogeneity or abbreviation homogeneity by the same principle as fundamentally as having explained using drawing 3, and the uniform lighting of a liquid crystal panel 7 is attained. However, in the source unit of sheet-like light shown in drawing 5, since 1 is making the convex curved surface about the light which passes through a through hole 8 by refraction 8d of central parts of 8d of said bottom sides, in the part, an operation of a concave lens is extended to nothing, it extends incident light right and left a little, and the light guide section material 1 maintains the include angle, and passes top side 8e. This improves the directive fault of LED and it contributes to the further improvement of equalization of the brightness of outgoing radiation light as a result.

[0038] In the source unit of sheet-like light shown in drawing 5, by setting up appropriately the curvature of the distance from LED of a through hole 8, the width of face of top side 8e, 8d of bottom sides, and top side 8e, the amount of the light by the above-mentioned three-kind root can be adjusted, and the purpose of equalization of the brightness of the illumination light can be attained.

[0039] Next, based on a drawing, the gestalt of various operations of this invention is explained in supervision. Drawing 6 is various kinds of flat-surface configuration **** Figs. of the blind hole 4 prepared in the light guide section material 1 of the source unit of sheet-like light concerning this invention, or a through hole 8, (a) shows the shape of an inverse triangle, and (b) reverse trapezoid configuration, and (c) shows the thing of both the bowstring type configuration. It is the configuration as what showed the configuration of (b) to drawing 3 and showed the configuration of (c) to drawing 1 at drawing 5 where the configuration of (a) is the same about these flat-surface configurations. Drawing 7 is drawing showing the cross-section configuration of various kinds of blind holes in case the blind hole is prepared in the light guide section material 1, and is a sectional view along the A-A cross section of drawing 6. You may be a configuration using the side of the polygon approximated instead of the part of the shape of radii of both the bowstring here about the thing of both the bowstring type configuration shown in drawing 6 (c).

[0040] If the gestalt of various operations of this invention is arranged, it may first have the through hole 8 whose flat-surface configurations are (a) of drawing 6, (b), and (c), respectively. Among these, (b) and (c) are already explained as what is shown in drawing 3 and drawing 5, respectively. Since the optical path which passes through a through hole in a center section about what has the through hole 8 whose flat-surface configuration is drawing 6 (a) although the distribution to right and left of incident light is fully made is not acquired, it is disadvantageous when only the part equalizes the brightness of the illumination light.

[0041] Next, when it has the blind hole 4 whose flat-surface configurations are (a) of drawing 6 , (b), and (c), respectively, it may have the A-A cross-section configuration shown in (a) of drawing 7 , (b), and (c) per each. Among these, about the combination of drawing 6 (a) and drawing 7 (a), explanation is made as what is already shown in drawing 1 . Although the principle fundamental about an operation of the source unit of sheet-like light using the blind hole by the combination of drawing 6 (a) and drawing 7 (b) is the same as that of what was shown in drawing 1 , base 4c of a blind hole 4 consists of a convex slant face 4c1 and 4c2, the thickness of bypass section 1c under a blind hole 4 is compared in the center, and both sides serve as size. On the other hand, as for the directivity of luminescence of LED, brightness has become [brightness] high low on both sides in the center. Therefore, the thickness of bypass section 1c and the directivity of luminescence complement each other, the consistency of the light which passes bypass section 1c serves as abbreviation homogeneity on a center and both sides, and it contributes to the further equalization of the brightness of the illumination light.

[0042] Although the principle fundamental about an operation of the source unit of sheet-like light using the blind hole by the combination of drawing 6 (a) and drawing 7 (c) is the same as that of what was shown in drawing 1 . As shown in drawing 7 (c), two or more irregularity 4c3 is formed in base 4c of a blind hole 4, the light which passes bypass section 1c according to an operation of this irregularity 4c3 is distributed by right and left, the directivity of luminescence of LED is eased, and it contributes to the further equalization of the brightness of the illumination light.

[0043] About an operation of the source unit of sheet-like light using the blind hole by the combination of drawing 6 (b) and drawing 7 (a), it has the effectiveness which piled up the operation by the through hole 8 which was shown and explained to drawing 3 , and a flat-surface configuration is indicated to be to drawing 6 (b), and the operation of the blind hole 4 shown and explained to drawing 1 , and has the effectiveness of equalization of the brightness of the illumination light as a whole. About an operation of the source unit of sheet-like light using the blind hole by the combination of drawing 6 (b) and drawing 7 (b), it has the effectiveness which piled up the operation by the through hole 8 which was shown and explained to drawing 3 , and a flat-surface configuration is indicated to be to drawing 6 (b), and the operation of the blind hole concerning above-mentioned drawing 7 (b), and has the effectiveness of equalization of the brightness of the illumination light as a whole. About an operation of the source unit of sheet-like light using the blind hole by the combination of drawing 6 (b) and drawing 7 (c), it has the effectiveness which piled up the operation by the through hole 8 which was shown and explained to drawing 3 , and a flat-surface configuration is indicated to be to drawing 6 (b), and the operation of the blind hole concerning above-mentioned drawing 7 (c), and has the effectiveness of equalization of the brightness of the illumination light as a whole.

[0044] About an operation of the source unit of sheet-like light using the blind hole by the combination of drawing 6 (c) and drawing 7 (a) It has the effectiveness which piled up the operation by the through hole 8 which was shown and explained to drawing 5 , and a flat-surface configuration is indicated to be to drawing 6 (c), and the operation of the blind hole 4 which was shown and explained to drawing 1 , and which is shown in drawing 7 (a), and has the effectiveness of equalization of the brightness of the illumination light as a whole. About an operation of the source unit of sheet-like light using the blind hole by the combination of drawing 6 (c) and drawing 7 (b), it has the effectiveness which piled up the operation by the through hole 8 which was shown and explained to drawing 5 , and a flat-surface configuration is indicated to be to drawing 6 (c), and the operation of the blind hole concerning above-mentioned drawing 7 (b), and has the effectiveness of equalization of the brightness of the illumination light as a whole. About an operation of the source unit of sheet-like light using the blind hole by the combination of drawing 6 (c) and drawing 7 (c), it has the effectiveness which piled up the operation by the through hole 8 which was shown and explained to drawing 5 , and whose flat-surface configuration is drawing 6 (c), and the operation of the blind hole concerning above-mentioned drawing 7 (c), and has the effectiveness of equalization of the brightness of the illumination light as a whole.

[0045] Below, based on a drawing, it explains per gestalt of other one operations of this invention. The gestalt of this operation starts the source unit of sheet-like light for multicolor lighting. Drawing 8 is drawing showing the configuration of the source unit of sheet-like light concerning the gestalt of this

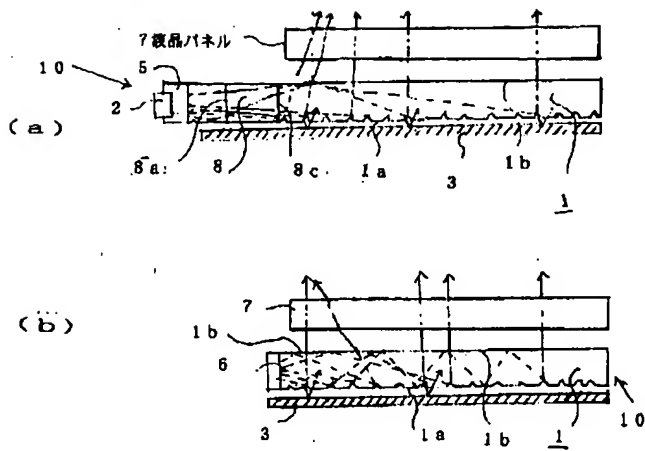
operation, and is an A-A sectional view [in / (a) and / in (b) / (a)]. [a perspective view] As shown in drawing 8 , the configuration of the light guide section material 1 is the same as that of what was shown and explained to drawing 3 . As shown in drawing 8 , LED2r of R arranged by lapping in the thickness direction of the light guide section material 1 at the single tier and G reach LED2g, and LED2 is constituted by LED2b of B. 2r, 2g, and the superficial location of 2b which are these LED are the same as the location of LED2 shown in drawing 3 . The notation of each element shown in drawing 8 about other points is the same as the notation of the element with which drawing 3 corresponds.

[0046] Since the light guide section material 1 serves as bilateral symmetry about such LED, when 2r, 2g, and 2b which are LED of each color are turned on according to an individual, the distribution of the brightness of the illumination light by which outgoing radiation is carried out from light exiting surface 1b of the light guide section material 1 becomes the thing of homogeneity by the principle which is bilateral symmetry and was already explained. Thus, the uniform multicolor (multicolor) lighting to a liquid crystal panel 7 is attained.

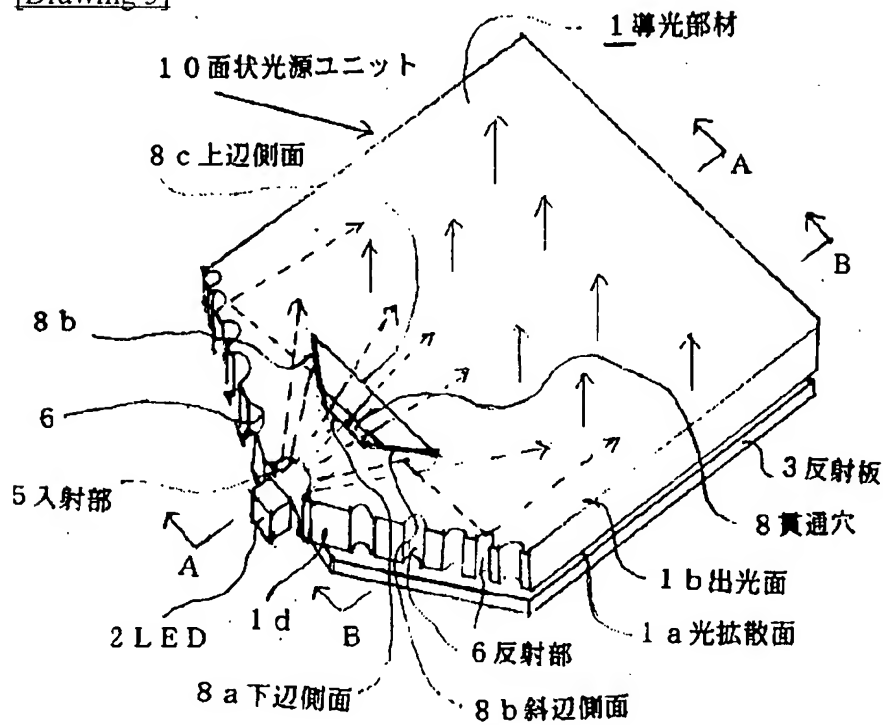
[0047]

[Effect of the Invention] As stated above, while distributing incident light to right and left in the source unit of sheet-like light of an edge light method at light guide section material according to this invention, using the punctiform light sources, such as LED of one piece or a decimal, as the light source By preparing the through hole or blind hole which has the operation which passes a part The light from the light source is uniformly extended by efficient optical-path conversion, and after considering as the condition that there is no directivity like a linear light source, it emanates to the field of the upper and lower sides of light guide section material, and enables it to carry out outgoing radiation of the flux of light of the shape of a field where brightness is uniform from an outgoing radiation side. Thereby, the illumination light is uniform and it becomes possible to offer the cheap source unit of sheet-like light by which the cost of the light source and reduction of power consumption were made.

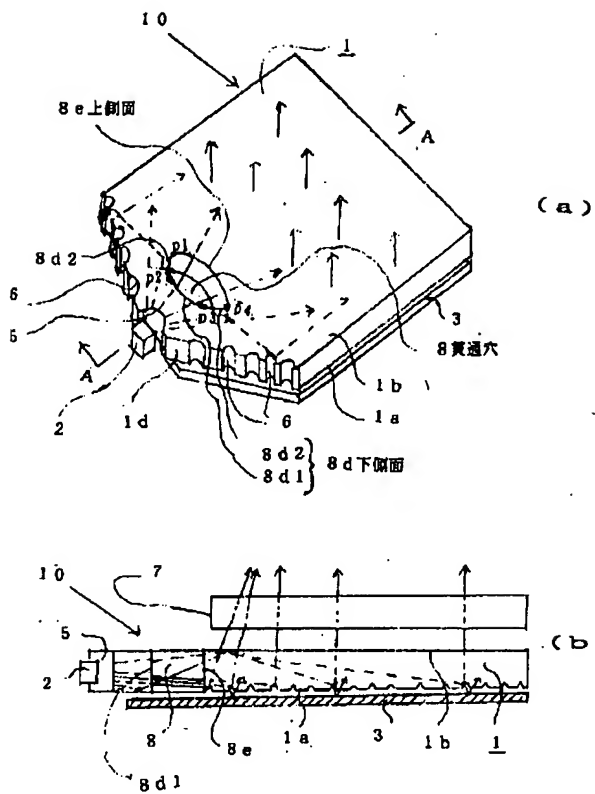
[Translation done.]



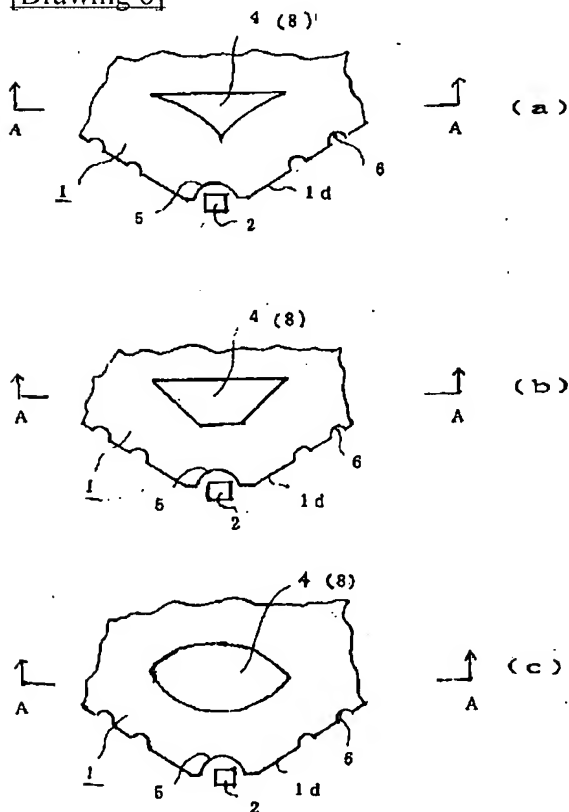
[Drawing 3]



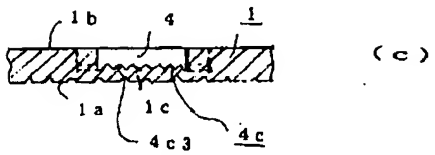
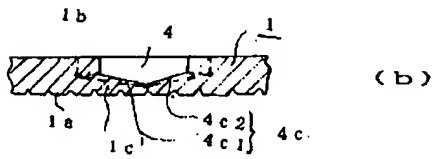
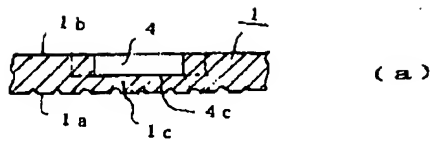
[Drawing 5]



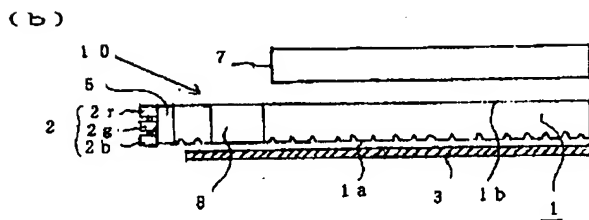
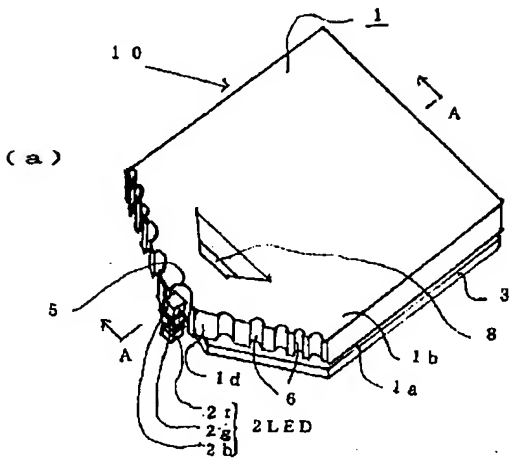
[Drawing 6]



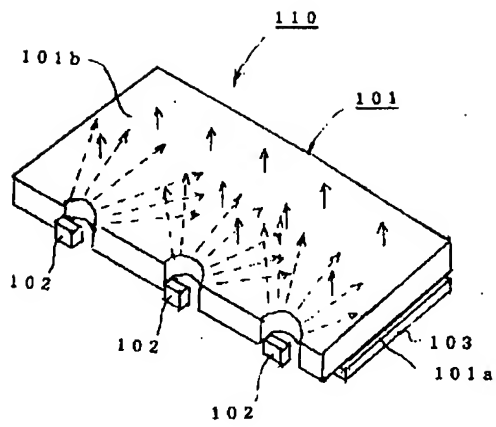
[Drawing 7]



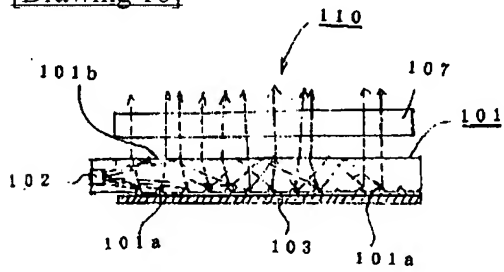
[Drawing 8]



[Drawing 9]



[Drawing 10]



[Translation done.]